Lab 5
BIEN 4320
11/ 17 /21
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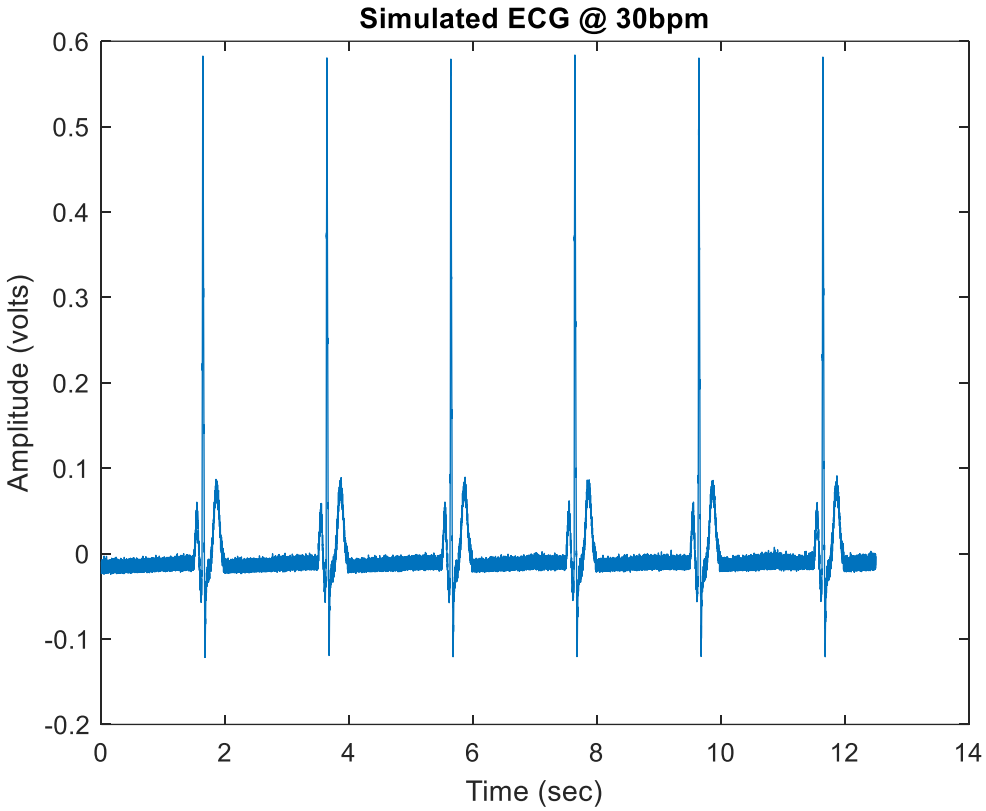
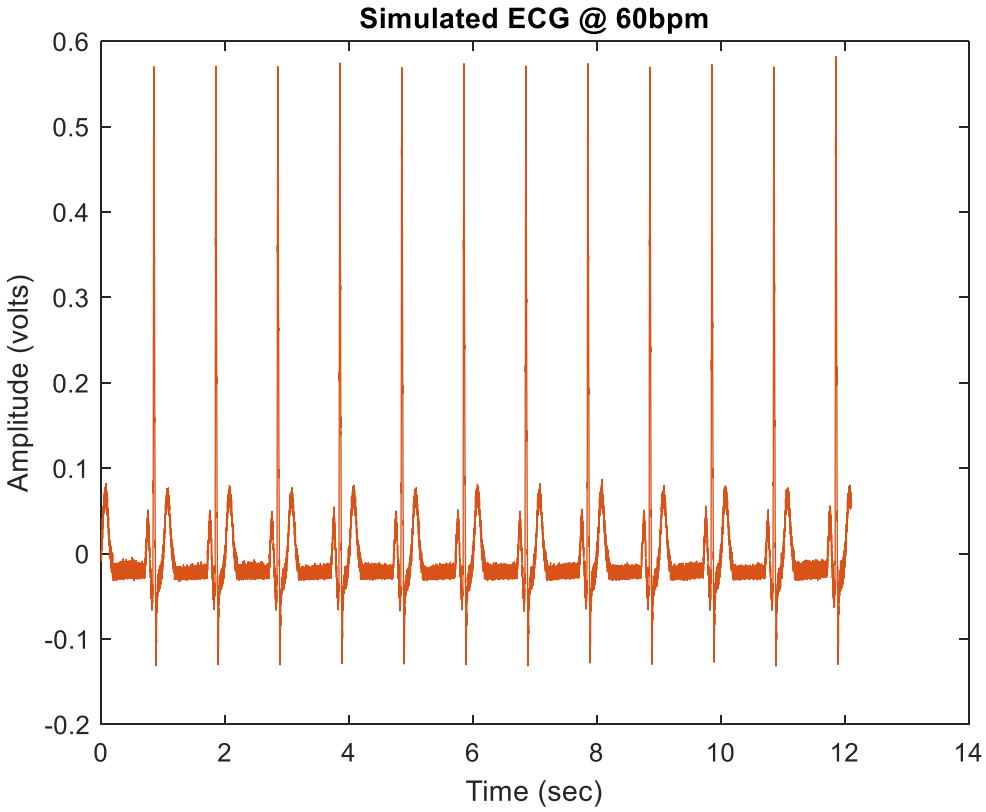
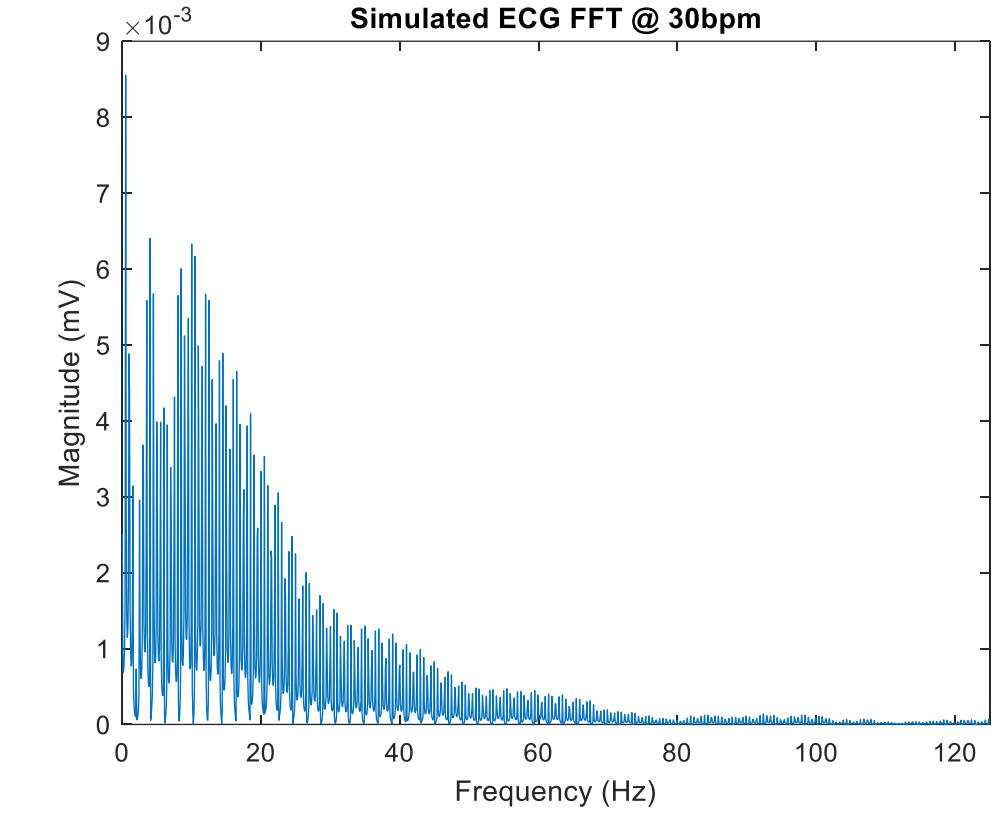
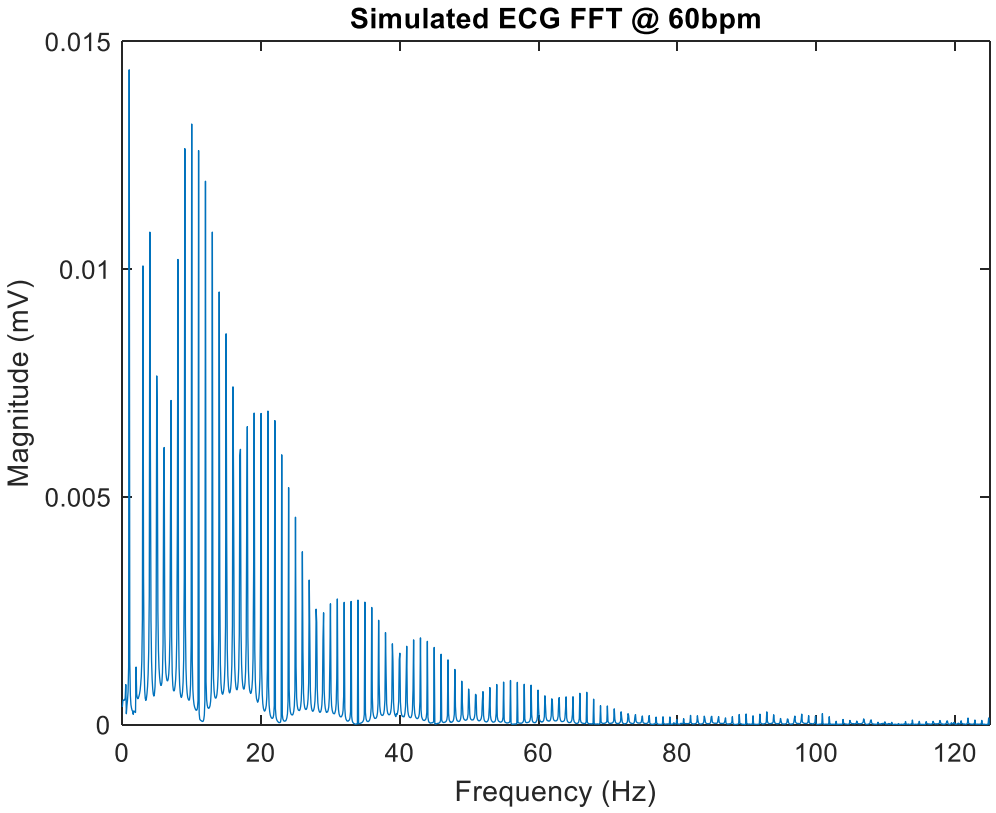




Original R-wave magnitude of 60bpm ECG: 0.0029 V (2.9 mV)


Simulated ECG FFT @ 30bpm
×10^-3
9
8
7
6
5
4
3
2
1
0
Magnitude (mV)
0
20
40
60
80
100
120
Frequency (Hz)


Simulated ECG FFT @ 60bpm
0.015
0.01
0.005
0
Magnitude (mV)
0
20
40
60
80
100
120
Frequency (Hz)

```
%% Lab 5a - Part 1

bpm30 = readmatrix('30bpm.txt'); % read both data files in a matrix
bpm60 = readmatrix('60bpm.txt');
fs = 1/.0001; % calculate sampling frequency

t_bpm30 = (1:length(bpm30))/fs; % create time vector

plot(t_bpm30, bpm30(:,2)); % plot data
xlabel('Time (sec)');
ylabel('Amplitude (volts)');
title('Simulated ECG @ 30bpm');

t_bpm60 = (1:length(bpm60))/fs; % create time vector

figure(2) % new figure
plot(t_bpm60, bpm60); % plot data
xlabel('Time (sec)');
ylabel('Amplitude (volts)');
title('Simulated ECG @ 60bpm');

%% Lab 5a - Part 2

gain = 49400/(200 + 1);
max_val = max(bpm60(:,2));
min_val = min(bpm60(:,2));

r_mag = (max_val - min_val)/gain;

%% Lab 5a - Part 3

f_bpm30 = (0:length(bpm30)/2)*fs/length(bpm30); % create frequency
vector
fft_bpm30 = fft(bpm30(:,2)); % calculate fft of signal
mag_bpm30 = abs(fft_bpm30/length(bpm30)); % calculate magnitude
scaled_bpm30 = mag_bpm30(1:length(bpm30)/2+1); % scale

figure(3)
plot(f_bpm30, scaled_bpm30); % plot fft
xlabel('Frequency (Hz)');
ylabel('Magnitude (mV)');
title('Simulated ECG FFT @ 30bpm');
xlim([0 125]); % limit plot to relevant frequencies

f_bpm60 = (0:length(bpm60)/2)*fs/length(bpm60); % create frequency
vector
fft_bpm60 = fft(bpm60(:,2)); % calculate fft of signal
mag_bpm60 = abs(fft_bpm60/length(bpm60)); % calculate magnitude
scaled_bpm60 = mag_bpm60(1:length(bpm60)/2+1); % scale

figure(4)
plot(f_bpm60, scaled_bpm60); % plot fft
```

```
xlabel('Frequency (Hz)');
ylabel('Magnitude (mV)');
title('Simulated ECG FFT @ 60bpm');
xlim([0 125]) % limit plot to relevant frequencies
```